

# Perception of climate change, loss of social capital and mental health in two groups of migrants from African countries

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## Abstract

**Introduction.** The negative effects of climate change affect community subsistence models, thus determining an increase in social conflicts, a loosening of social capital, an increase in the incidence of traumas and diseases, and a push for migration.

**Aim.** This exploratory research compares the perception of climate change, as well as the reduction of social capital and mental health, in two groups of migrants arriving in Italy from African countries with high or extreme vulnerability to climate change.

**Methods.** The perception of climate change and the degree of social capital were assessed with a semi-structured interview. The psychological condition was investigated through a clinical psychological interview and tests.

**Results.** The group of migrants coming from countries with extreme exposure to climate change perceive greater vulnerability of their country and reports a greater loss of social capital. The level of education does not seem to affect the ability to perceive climate change. In the entire sample, there is a strong correlation between the perception of change and the loss of social capital, and between the loss of social capital and emotional disorders.

**Conclusions.** The study suggests that actions to preserve the social capital of a community strongly exposed to climate change can mitigate the impact of change on mental health.

## Key words

- climate change
- social capital
- mental health
- migration

## INTRODUCTION

Climate change is a gradual and long-term process, producing environmental effects of varying duration: acute and catastrophic events, such as floods; sub-acute events, such as drought or heat waves; and finally longer-term changes, such as desertification, modification and erosion of the physical environment on which food supply and the economic condition of the population depends. The exposure of the communities to the effects of climate change are differentiated in various countries. Within the same country, it is greater for those who live in rural areas, those already suffering from a condition of malnutrition, children, women and the elderly, those suffering from chronic diseases, those with a low level of education and technological know-how, and those who are poorer and have less access to credit [1]. The negative effects of climate change affect community subsistence models, determine an increase

in social conflicts, a loosening of social cohesion, an increase in the incidence of traumas, diseases, epidemics and early deaths, and a push for migration to urban areas and other states, with a gradual abandonment of the most exposed environments [2].

According to the data published by the Internal Displacement Monitoring Center [3], from 2008 to today on average 26.4 million people a year have been forced to migrate due to natural catastrophic events.

The international agencies estimate that by 2050 there will be 200 million migrants for climatic reasons [4]. The number of “environmental refugees” has now surpassed that of war refugees, although the Geneva Convention only recognizes the rights of the latter.

The perception of climate change appears to be greater in rural areas and the most frequently felt aspects are, in developing countries, the increase in temperatures and the decrease in precipitation [5, 6].

A study by Ishaya and Abaje [1] shows that the perceived threat of change concerns health, food supply, biodiversity reduction and the availability of firewood; other aspects that are felt are the catastrophic events, the reduction of resources, such as water and electricity, as well as that of basic public services.

A greater perception seems to be directly linked to the level of income, age and life experience, education, exposure to the media and available information [7, 8].

An important negative effect of climate change is the reduction of social capital, a construct that combines community participation and social cohesion. Social capital can be defined as “the characteristics of a social organization, in particular trust, norms and networks that can improve the efficiency of society by facilitating coordinated actions” [9]. It is expressed at both individual and community level. At the individual level it is linked to the number of family members, to relations of confidence and non-family friends, to contacts with the neighborhood, to participation in recreational and associative activities, to the consideration enjoyed in one's own community and to attachment to the place. At the community level, social capital is expressed in the network of public services, such as education, security and health, in the associative and voluntary network, in trust in others, and in the absence of ethnic, religious or political conflicts. Many studies have investigated the impact of climate change on the physical health of a population, while there is little research on the impact of climate change on mental health [10-12]. There is evidence about the relationship between climate change and mental health gathered in specific populations of Australia or Northern Canada, such as the Inuit. However, studies on populations equally exposed to climate change, such as those in Central Africa, are lacking.

Our research examines a sample of migrants arriving in Italy from African countries, divided into two groups, one from countries characterized by extreme vulnerability to climate change, the other coming from countries with high vulnerability.

Objectives of the study are:

- to verify, through the comparison between the two groups, the differences in the perception of change, both global and in its different components, in the loss of social capital and mental health;
- analyze the most perceived aspects of the change in the entire sample;
- investigate the relationships between the perception of change, the loss of social capital and mental health in the entire sample;
- analyze if the perception of climate change is influenced by variables such as school years and the place of life (city-village).

The hypotheses are that migrants from countries with extreme vulnerability present a greater perception of climate change, a greater loss of social capital and a greater presence of emotional disturbances compared to those from countries with high vulnerability. Other hypotheses are that there is a significant relationship between the perception of climate change and the loss of social capital and between the loss of social capital and the extent of emotional disturbances. Finally, we

assume that the perception of climate change is conditioned by the level of education.

## MATERIALS AND METHODS

### *The ND-GAIN Vulnerability Index to climate change*

Encouraged by policy makers, numerous research groups in recent years have attempted to quantify the effects of climate change on a national scale. This effort culminated in the development of several indices, based on an extensive number of indicators [13]. As for the countries of origin, one of the most used indexes to measure the severity of climate change is the one developed by the research group of the University of Notre Dame, called Notre Dame Global Adaptation Initiative (ND-GAIN). The ND-GAIN Country Index [14] is a global index that combines a vulnerability index of the country with climate change and an index of readiness as well as the willingness to face the changes.

In this study to distinguish the different countries of origin and compose the groups, we considered only the index of vulnerability. It measures the exposure, sensitivity and adaptability of the country in six vital sectors: food, water, health, ecological services, human habitats and infrastructures. The exposure reflects the degree to which a system is exposed to climate change from a physical and biological point of view. Sensitivity measures the degree to which the most important productive sectors of the country are negatively influenced by climate risk and the proportion of the population particularly susceptible to a risk of climate change. Adaptive capacity assesses the availability of social resources for adaptation to climate change.

Vulnerability is composed of 36 indicators. Each component has 12 indicators, crossed with 6 sectors. To obtain the overall score, the score for each sector was calculated by taking the arithmetic mean of its 6 constituent indicators (all on a 0-1 scale, weighted equally). Then the overall vulnerability score was calculated by taking the arithmetic mean of the 6 sector scores. The ND-GAIN Index therefore has a value ranging from 0 to 1; the higher it is, the more vulnerable the country is to climate change. A score more than 0.45 indicates a high vulnerability, while a score more than 0.55 an extreme vulnerability.

Among the available exposure indexes, in the present study it was decided to adopt the ND-GAIN Index for the high number of countries considered (181), the use of public data processed by international bodies and organizations, and its comparability with other indexes.

### *Participants*

The research was conducted in three extraordinary reception centers for migrants (Centri di Accoglienza Straordinaria – CAS) based in Treviso, Oderzo and Vittorio Veneto, Northern Italy. In these centers, asylum seekers receive food and lodging, medical and psychological assistance, and participate in integration activities, such as learning the Italian language or professional training. 651 migrants are currently welcomed in these centers, the majority of which come from African countries. Some countries, particularly Nigeria, are highly represented, while other countries, such as

Liberia or Afghanistan, are under-represented. Two different groups of migrants were recruited: a group of 50 people from countries with extreme vulnerability to climate change and a group of 50 from countries with a high degree of vulnerability. Many of them were economically and socially disadvantaged people even in their countries of origin and therefore they were most exposed and vulnerable to climate change [15].

Table 1 shows the ND-GAIN Vulnerability Index of the different countries, considering that at a higher value corresponds a greater vulnerability. As can be seen, they range from extreme values such as those of Niger and Liberia to values that are as high as those of Ghana and Cameroon.

**Table 1**  
ND-GAIN (Notre Dame Global Adaptation Initiative) index of countries with extreme, very high, and high vulnerability to climate change

Country	Score	World ranking
Niger	0.680	180
Liberia	0.616	174
Mali	0.614	173
Afghanistan	0.596	171
Burkina Faso	0.582	162
Sierra Leone	0.560	156
...		
Gambia	0.538	141
Senegal	0.538	139
...		
Nigeria	0.485	127
Cameroon	0.484	124
Ghana	0.469	114

Some countries from which migrants come, such as Gambia and Senegal, present intermediate values and were not considered in the research.

As can be seen in Table 2, there are no considerable differences between the two groups regarding the months of stay in Italy and the presence of a diagnosed psychiatric pathology. Screening for mental disorders was done by CAS psychologists, using the clinical interview and PHQ-9 and GAD-7 tests; the diagnosis was carried out by the psychiatrists of Mental Health Center. Gross domestic product was calculated by attributing to each migrant the GDP *per capita* of their country; the data refers to 2017 and was provided by the World Bank.

For some countries, all asylum seekers were recruited, while for other countries, such as Nigeria, which were over-represented, the subjects with characteristics most similar to those of the other sample were selected; despite this, the two groups differ in many variables, such as education, religion, the place of life, gross domestic product per capita, due to the differences that characterize the countries of origin.

**Materials and procedures**

In each of the two groups, we evaluated, through a semi-structured interview, the knowledge and perception of climate change and the magnitude of social capital.

In the first part the questions asked in the interview reproduced the factors already illustrated by the ND-GAIN Vulnerability Index regarding the knowledge and perception of climate change; subjects were required to report changes in the country of origin in the last 5 years of their stay. In a second part of the interview the questions concerned the constitutive elements of the social capital: availability of health services, presence of the State and public safety, availability of schools, extension of the family network (cohabitants and neighbors with daily reports), satisfaction with relationships in the fam-

**Table 2**  
Demographic, socio-economic, and clinical characteristics of the two groups of migrants

	High vulnerability (n = 50)	Extreme vulnerability (n = 50)
Native country	Nigeria 60% Ghana 28% Cameroon 12%	Mali 60% Burkina Faso 14% Sierra Leone 12% Afghanistan 6% Liberia 4% Niger 4%
Age (mean)	27.90	23.68
Years of schooling (mean)	7.56	4.36
Religion	Christian (94%)	Muslim (96%)
Gross Domestic Product per capita (mean in US dollars)	2017	778
Place of life:		
• Village	34%	50%
• Shanty town or suburbs	16%	26%
• City center	50%	24%
Months from arrival in Italy (mean)	18.1	17.6
Psychiatric diagnosis	1 (2%) Psychosis, substance abuse	1 (2%) Psychosis, substance abuse

ily, extension of the friendly and neighborhood network, problematic relationships with neighbors, existence of at least a relationship of trust outside the family, consideration enjoyed within the community of reference; participation in any form of association, including those of a religious kind; relationships with people of different ethnicity or religion, problems and conflicts, poverty compared to the rest of the community, and deaths not expected and not determined by old age.

Finally, the same people were evaluated from the psychological point of view both through a clinical interview and through two psychological tests, the PHQ-9 and the GAD-7 [16, 17].

The study was worked out according to the International Guidelines and Ethical Codes of the Belmont and Oviedo Chart as well as the first section, paragraph 9, of the Italian ethical code of Psychologists. The research protocol was approved by the Ethics Committee and the Prefect of Treviso.

The PHQ-9 is composed of 9 items and investigates depressive symptoms, has versions in many languages, and a score greater than or equal to 15 indicates the probable presence of major depression.

The GAD-7 is composed of 7 items and investigates the anxious symptoms, has versions in many languages, and a score higher than 10 indicates the possible presence of an anxiety disorder. The Global emotional disorders score was obtained by adding the PHQ-9 and GAD-7 scores and dividing the result by two.

As can be seen in *Appendix 1* (available online as Supplementary Material) the guide for the semi-structured interview included for each factor the definition of the construct, the guiding questions to be used, and the criteria for classifying the answers. Both the interviews and the tests were administered either in the language of origin, with the support of a cultural mediator; or for French-speaking or English-speaking subjects in French or English.

## RESULTS AND DISCUSSION

The results obtained from the interviews are shown in *Table 3* and the significance of the differences between

the two groups was analyzed with Student's *t* Index. Furthermore, the effect size of the difference between the means was calculated using Cohen's *d*. Statistical analysis was performed with SPSS Version 25.0 statistic software package.

As you can see the total perception of climate change shows a significant difference between people who come from countries with extreme vulnerability, which therefore perceive a higher degree of climate change, and people who come from countries with high vulnerability.

The difference is significant also for two single items, i.e. the lower availability of water and the lower availability of electricity. Cohen's *d* scores indicate a medium effect size for the items reduced water availability, heatwave periods/ delay in rainy season, no improvement in agriculture, and for global perception; a large effect size is noted for reduced electricity availability.

*Table 4* shows the scores of the interview on the social capital.

The social capital has a global value that shows a difference which, however, is at the limits of significance, precisely 0.05. Two aspects are instead relevant, with a significant difference between people from countries with extreme vulnerability and people from countries with high vulnerability; these are membership participation and social security.

Cohen's *d* scores indicate a medium positive effect size for the following items: health services availability, school availability, friend network, and global social capital. Instead we observe a medium negative effect size for family satisfaction and relationship outside family. A large positive effect size is noted for social safety and associative participation.

The differences must be interpreted with caution because the two groups differ in many variables. For this purpose, we conducted two multiple regression analyses with perception of climate change and social capital scores as dependent variables, and socio-economic (age, schooling, place of life and gross domestic product per capita) and vulnerability scores as explanatory variables. The two models have weak explanatory power

**Table 3**  
Mean 9 item Interview on perception of climate change and global perception scores, by two groups of migrants

Variables	High vulnerability (mean)	Extreme vulnerability (mean)	Student's test <i>t</i> (98)	Student's test <i>p</i> value	Cohen's <i>d</i>
Dependency on food supply	1.30	1.34	-0.281	0.779	-0.05
Reduced food availability	0.60	0.72	-0.710	0.480	-0.14
Reduced water availability*	1.18	1.64	-2.037	0.044	-0.41
Problem in waste disposal	0.60	0.54	0.601	0.549	0.12
Heatwave periods/delay in rainy season	0.66	0.76	-1.098	0.275	-0.21
Catastrophic weather events	1.24	1.34	-0.521	0.604	-0.10
Changes in vegetation	0.56	0.50	0.767	0.552	0.11
Reduced electricity availability*	1.10	1.52	-3.100	0.003	-0.61
No improvements in agriculture	0.64	0.80	1.793	0.076	-0.35
Global Perception*	0.88	1.02	-2.163	0.033	-0.32

\* statistical significance ( $p < 0.05$ )

**Table 4**

Mean 11 item Interview on social capital and global social capital scores, by two groups of migrants

Variables	Hight vulnerability (mean)	Extreme vulnerability (mean)	Student's test t (98)	Student's test p value	Cohen's d
Health services availability	1.56	1.36	1.375	0.172	0.27
Social safety *	0.74	0.40	3.463	0.001	0.69
School availability	1.66	1.34	1.943	0.055	0.38
Family network size	2.10	1.96	0.685	0.495	0.13
Family satisfaction	0.64	0.80	-1.793	0.076	-0.35
Friend network	0.72	0.58	1.469	0.145	0.29
Relationships outside family	0.60	0.70	-1.043	0.299	-0.21
Respect from community	0.98	1.08	-0.866	0.389	-0.17
Associative partecipation *	0.70	0.42	2.910	0.004	0.58
No poverty	0.84	0.76	0.681	0.498	0.13
No unexpected bereavements	0.98	1.06	-0.598	0.551	-0.11
Global social capital	1.05	0.95	1.982	0.050	0.31

\* statistical significance ( $p < 0.05$ )**Table 5**

Mean GAD-7, PHQ-9 and Global emotional disorders scores, by two groups of migrants

	Hight vulnerability (mean)	Extreme vulnerability (mean)	Student's test t (98)	Student's test p value	Cohen's d
GAD-7					
General Anxiety Disorder-7	4.88	5.94	-1.254	0.213	0.37
PHQ-9					
Patient Health	5.40	5.54	-0.138	0.890	0.03
Questionnaire-9					
Global emotional disorders	5.14	5.74	-0.721	0.473	0.18

( $r^2 = 0.102$  for perception and  $r^2 = 0.098$  for social capital); therefore, it seems that the differences observed between the two group are scarcely affected by these predictors.

As for emotional disorders (Table 5) there are differences between the overall scores of PHQ-9 and GAD-7, but they are modest and not significant. D Index shows a medium effect for anxiety symptoms.

Again, based on the results of the interview, but analyzing the data of the entire sample of 100 subjects, the aspects of climate change most perceived by people were analyzed. For each aspect, the subjects who in the last 5 years detected a change in the negative direction and regardless of the intensity of this change (slight, moderate or high), were therefore counted.

Table 6 shows how the most perceived aspects are the dependence in obtaining food and the lack or reduction in the availability of electricity.

Regarding the data studied from the correlational point of view on the total subjects, then the bivariate correlations using Pearson's r-index, a first element that seemed important to us is that the years of schooling do not correlate with the perception of change climate ( $r = -0.022$ ). This seems to show that even people with lower education or illiteracy and poorer people perceive signs

of climate change equally and accurately.

Figure 1 shows that, as was our hypothesis, the perception of climate change is very strongly correlated with the social capital. It is a moderate relationship ( $r = -0.416$ ) and a negative one, that is, as the perception of climate change increases, the social capital decreases. Equally significant ( $r = -0.256$ ) is the relationship between loss of social capital and emotional disorders. Finally, a direct relationship, equally significant, but weaker ( $r = 0.231$ ), is between perception of climate change and emotional disorders.

## CONCLUSIONS

The group of migrants coming from countries with extreme exposure to climate change perceive the greater vulnerability of their country as being linked to the reduction in the availability of water and electricity. In both groups the aspects of climate change that are most strongly felt are the greater dependence on food supply and the lack or reduction in the availability of electricity.

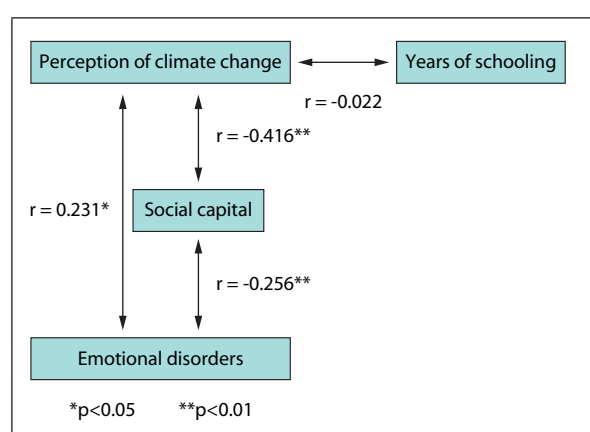
About 2 migrants out of 3 noticed an increase in heat waves, a delay in the rainy season, an increase in extreme and catastrophic atmospheric events, and a lower availability of drinking water. The perception



**Table 6**

Perception of the variables of climate change by all subjects (n = 100)

Variable	N of subjects that detect a negative change in the last 5 years
Dependency on food supply	86
Lack or reduction of electricity availability	86
No improvements in agriculture technologies	72
Heath wave periods and delay in rainy season	71
Lack or reduction in access to reliable drinking water	67
Catastrophic weather events	65
Problems in waste disposal	57
Reduced food availability, malnutrition	42

**Figure 1**Bivariate correlations between the variables (total score) using Pearson's *r*.

of food shortages, malnutrition, and problems with waste disposal are lower, although still quite high. The extremely vulnerable group reports a greater loss of social capital, relating to public security and membership participation.

The level of education does not seem to affect the ability to perceive climate change. In the entire sample, at a personal level there is a moderate correlation between the perception of change and the loss of social

capital and between loss of social capital and emotional disorders. Significant but weaker is the correlation between perception and emotional disorders. There are therefore indications that social capital is a useful intermediate variable between climate change and mental health; actions to preserve social capital can mitigate the impact of climate change on mental health.

The limitations of the study are many. It is, on the other hand, an exploratory study.

The two groups, for the reasons we have seen, differ in age, schooling, place of life, gross domestic product per capita and religion. Finally, the research was conducted from the 15th to the 19th month after arriving in Italy, even though it would have been more appropriate to conduct it in the first months of arrival to investigate more effectively the emotional disorders related to climate change and life in the country of origin.

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### Conflict of interest statement

The Authors declare that there is no conflict of interest regarding the publication of this paper.

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